Marine-Based Polysaccharides in Nose-to-Brain Drug Delivery

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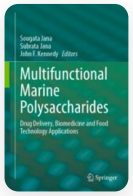

Multifunctional Marine Polysaccharides

Shubhrat Maheshwari, Aditya Singh, Amita Verma, Vaseem A. Ansari, Juber Akhtar & Bhupendra G. Prajapati

Abstract

This chapter explores the potential of marine-based polysaccharides in nose-to-brain drug delivery systems, focusing on their applications for treating central nervous system (CNS) disorders. Marine polysaccharides, including alginates, chitosan, and carrageenans, offer unique advantages due to their natural biocompatibility, biodegradability, and ability to form gels with desirable mechanical properties for drug delivery. These polysaccharides exhibit excellent mucoadhesive properties, enhancing the sustained release and absorption of therapeutic agents through the nasal mucosa. They can effectively bypass the blood-brain barrier (BBB) via olfactory and trigeminal nerve pathways, providing a noninvasive alternative to traditional drug delivery methods. The chapter highlights various synthesis strategies for marine polysaccharide-based hydrogels, including chemical crosslinking and physical stimuli-responsive gelation, and discusses their combination with nanoparticles for enhanced drug release and targeting. In vitro and in vivo studies demonstrate the successful application of these systems in nose-to-brain (N2B) drug delivery, with improved drug retention, reduced side effects, and enhanced therapeutic effects. While challenges remain in improving mechanical strength and optimizing drug release profiles, marine polysaccharides offer great promise as drug carriers for CNS treatments. Further research and development are essential to realize their full potential for treating neurological diseases.

Bioconjugate Chemistry | Bioinspired Materials | Biopolymers | Polyhydroxyalkanoates | Polysaccharide sequencing | Polysaccharide-Based Drug Delivery Systems

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Author information

Authors and Affiliations

Bioorganic and Medicinal Chemistry Research Laboratory, Department of Pharmaceutical Sciences, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India
Shubhrat Maheshwari & Amita Verma

Department of Pharmacy, Faculty of Pharmacy, Integral University, Lucknow, Uttar Pradesh, India
Aditya Singh, Vaseem A. Ansari & Juber Akhtar

Department of Pharmaceutics, Parul Institute of Pharmacy, Faculty of Pharmacy, Parul University, Vadodara, Gujarat, India
Bhupendra G. Prajapati

Corresponding author

Correspondence to Bhupendra G. Prajapati.

Editor information

Editors and Affiliations

Directorate of Health Services, Department of Health and Family Welfare, Kolkata, West Bengal, India
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